4.3 Hanford Site Drinking Water Surveillance

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The primary purpose of Hanford Site drinking water surveillance is to verify the quality of the site's drinking water. This is achieved by the routine collection and analysis of drinking water samples and the comparison of the resulting data with established drinking water standards and guidelines (WAC 246-290, 40 CFR 141, EPA-570/9-76-003, EPA 822-R-96-001, DOE Order 5400.5; see Appendix C, Tables C.2 and C.5). From January through September 1998, most radiological surveillance of DOE-owned drinking water systems on the site was conducted by Pacific Northwest National Laboratory for DynCorp Tri-Cities Services, Inc. DE&S Hanford, Inc. collected radiological data for a single system in the 100-K Area (Table 4.3.1). In October 1998, Pacific Northwest National Laboratory assumed responsibility for radiological surveillance of the 100-K Area system. Chemical and microbiological monitoring of all onsite, DOE-owned, drinking water systems was conducted by DynCorp Tri-Cities Services, Inc.

The national primary drinking water regulations of the Safe Drinking Water Act of 1974 apply to the drinking water supplies at the Hanford Site. These regulations are enforced by the Washington State Department of Health. WAC 246-290 requires that all drinking water analytical results be reported routinely to the Washington State Department of Health. In recent years, summary and individual radiological results have been reported to the state through this annual Hanford Site environmental report and through a supplemental data compilation (PNNL-12088, APP. 1). Nonradiological data have been reported to the state by DynCorp Tri-Cities Services, Inc. and have not been published.

4.3.1 Radiological Monitoring of Hanford Site Drinking Water Systems

Drinking water was supplied to DOE facilities on the site by 12 DOE-owned, contractor-operated, water treatment systems (see Table 4.3.1) and one system owned and operated by the city of Richland. Ten of these systems (including Richland's system) used water from the Columbia River. Three systems used groundwater from beneath the site. Most of the systems were operated by DynCorp Tri-Cities Services, Inc.; however, DE&S Hanford, Inc., Bechtel Hanford, Inc., and B&W Hanford Company also each operated one system, though water for the Bechtel Hanford, Inc. system was supplied by a pumping station operated by DynCorp Tri-Cities Services, Inc. The city of Richland provided drinking water to the 700 Area, 1100 Area (now owned by the Port of Benton), and Richland North Area and served as a backup supplier for the 300 Area. Water from the city of Richland's system was not monitored through the site drinking water surveillance project; however, personnel from Pacific Northwest National Laboratory's Surface Environmental Surveillance Project routinely collected water samples from the Columbia River at the Richland Pumphouse, which is the city of Richland's drinking water intake. The analytical results (radiological) for these samples of untreated river water can be found in Appendix A (Table A.2).

Table 4.3.1. DOE-Owned Drinking Water Systems on the Hanford Site, 1998

Location/Number	Source of Supply	Notes
100-D/001761	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 183-D Pumphouse. Operated by DynCorp Tri-Cities Services, Inc.
100-B/04480U	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 182-B Reservoir Pumphouse. Operated by DynCorp Tri-Cities Services, Inc.
100-K/00177J	Columbia River via 181-K Pumphouse	Filtered and chlorinated at 183-KE Water Treatment Plant. Operated by DE&S Hanford, Inc.
100-N/418532	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 183-N Water Treatment Plant. Operated by Bechtel Hanford, Inc.
200-E/41866V	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 283-E Water Treatment Plant. Operated by DynCorp Tri-Cities Services, Inc.
200-W/001004	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 283-W Water Treatment Plan. Operated by DynCorp Tri-Cities Services, Inc.
251 Building/001782 (electrical switching)	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 251 Building. Operated by DynCorp Tri-Cities Services, Inc.
609 Building/001806 (100 Areas Fire Station)	Columbia River via 181-B or D raw water export	Filtered and chlorinated at 609 Building. Operated by DynCorp Tri-Cities Services, Inc.
Yakima Barricade/ 001848	Well 699-49-100C	No treatment provided. Operated by DynCorp Tri-Cities Services, Inc.
Patrol Training Academy/00183Q	Well 699-S28-E0	Chlorination only. Operated by DynCorp Tri-Cities Services, Inc.
400 Area/419470	Wells 499-S1-8J, 499-S0-7, and 499-S0-8	Supplied from well 499-S1-8J (P-16); well 499-S0-8 (P-14) is the emergency supply, well 499-S0-7 (P-15) is the dire emergency supply. Chlorination only. Operated by B&W Hanford Company.
300 Area/418408	Columbia River via 312 Pump-house or city of Richland	Filtered and chlorinated at 315 Building. Operated by DynCorp Tri-Cities Services, Inc.

In 1998, radionuclide activities in onsite drinking water were monitored at the seven facilities shown in Figure 4.3.1, which represent the principal water supply facilities for the site's DOE-owned drinking water treatment systems. The 100-B Area pumphouse continued to serve as the primary Columbia River pumping station for many areas on the site (100-N Area, 200-East and 200-West Areas, 251 Building, and 100 Areas Fire Station), with the 100-D Area pumphouse available as an emergency backup. Water for the 100-K Area was supplied by the 181-KE Pumphouse. The 300 Area obtained its water via the 312 Pumphouse or the city of Richland. The Yakima Barricade, Patrol Training Academy, and 400 Area (Fast Flux Test Facility) obtained water from groundwater wells.

The 400 Area continued to use well 499-S1-8J (P-16) for drinking water, with well 499-S0-8 (P-14) serving as the emergency supply. Well 499-S0-8 supplied drinking water for a total of 959 h during 1998 (251.1 h in May, 293.4 h in June, 202.4 h in July, 165.8 h in August, 46.4 h in December) when well 499-S1-8J was offline for rebuild and maintenance. Well 499-SO-7 (P-15) continued to function as the dire emergency supply and furnished drinking water for approximately 11 h in July when well 499-SO-8 could not keep up with the demand. In addition to supplying drinking water, these three wells are also important for maintaining fire suppression capabilities within the 400 Area.

4.3.2 Collection of Drinking Water Samples and Analytes of Interest

Drinking water samples were collected according to a schedule established at the beginning of the calendar year (PNNL-11803). A majority of the samples were collected and analyzed quarterly. The 300 Area samples were collected monthly and composited for quarterly analysis. The Yakima Barricade and Patrol Training Academy samples were collected quarterly and composited for annual analysis. Samples from most locations were grab samples of untreated water. The 400 Area and Patrol Academy samples were treated water. Samples of untreated well water were also collected from the 400 Area drinking water wells by the Hanford Groundwater Monitoring Project. These samples were analyzed monthly. Drinking water samples obtained from the 100-B Area pumphouse and the 400 Area in April were cosampled with the Washington State Department of Health. The analytical results from the state's samples help to verify the quality of the drinking water data reported herein and in PNNL-12088, APP. 1.

All 1998 drinking water samples were analyzed for gross alpha, gross beta, tritium, and strontium-90. Additionally, samples from the 300 Area were analyzed for uranium and technetium, and plutonium and americium activities were monitored in water from the 100-K Area. The 100-K Area and 300 Area samples were also analyzed by gamma spectroscopy.

Gross alpha and gross beta measurements provided a general indication of radioactive contamination. Gamma spectroscopy was used to detect numerous specific radionuclides (see Appendix E). Radiochemical analyses were used to determine the activities of other specific radionuclides.

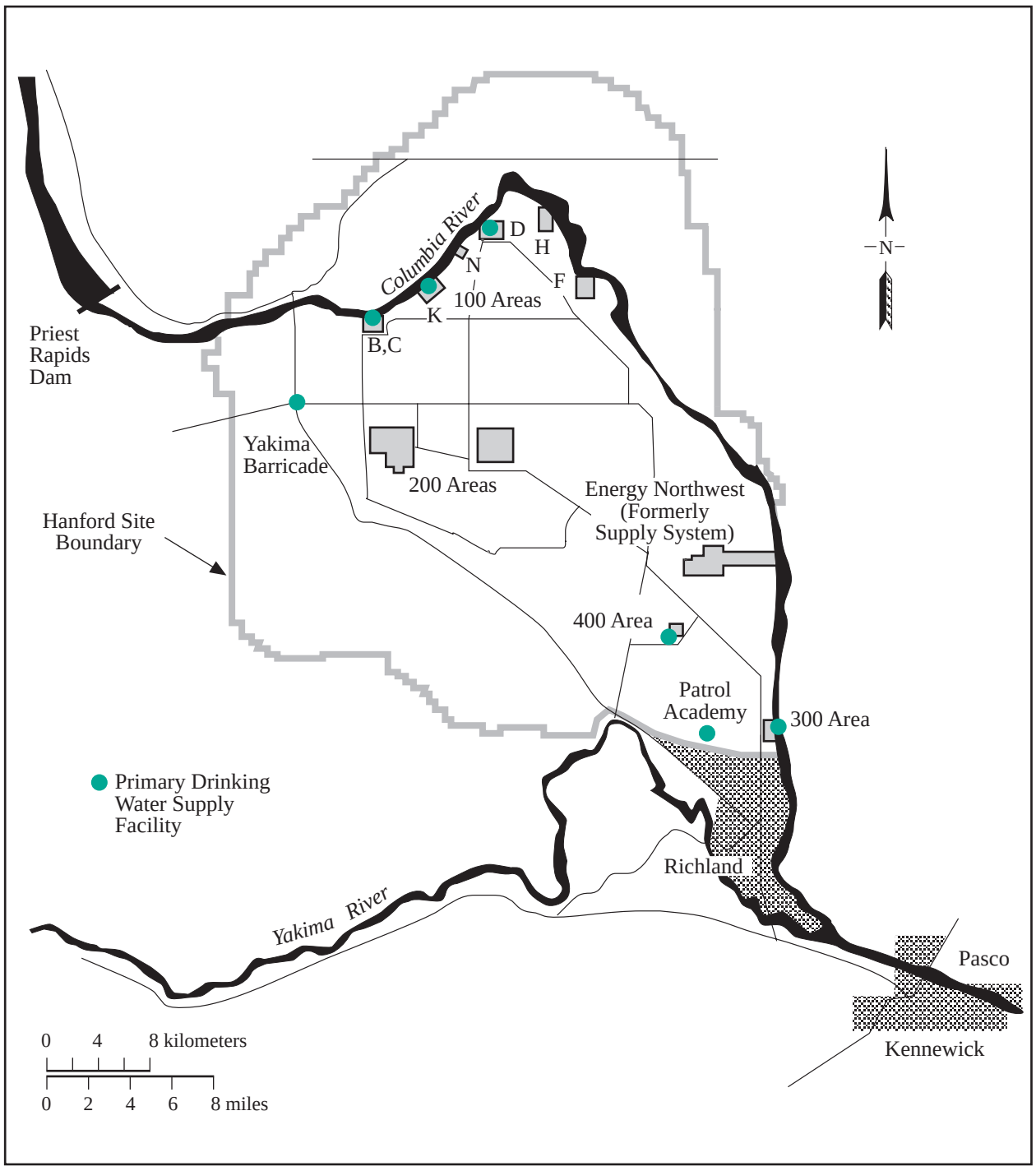

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Figure 4.3.1. Hanford Site Primary Drinking Water Supply Facilities, 1998

4.3.3 Radiological Results for Hanford Site Drinking Water

Results for radiological monitoring of Hanford Site drinking water during 1998 are summarized in Table 4.3.2. Gross alpha, gross beta, tritium, strontium-90, and total uranium activities are included in the table to demonstrate compliance with drinking water standards. The maximum amount of beta-gamma radiation from man-made radionuclides allowed in drinking water by Washington State and the EPA is an annual average activity that will not produce an annual dose equivalent to the whole body or any internal organ greater than 4 mrem/yr. If both tritium and strontium-90 are present, the sum of their annual dose equivalent to bone marrow must not exceed 4 mrem. Compliance with this standard may be assumed if the annual average activity for each of gross alpha, gross beta,

Table 4.3.2. Selected Radiological Constituents in Hanford Site Drinking Water, 1998 Annual Average Activities (pCi/L)[a]

System	No. of Samples	Gross Alpha	Gross Beta	Tritium	Strontium-90	Total Uranium
100-B Area	4[b,c]	0.52 ± 0.19	0.47 ± 0.46	119 ± 45	0.93 ± 0.02	NM[d]
100-D Area	4[b,c]	1.80 ± 2.56	2.19 ± 1.57	37.4 ± 19.3	0.11 ± 0.02	NM
100-K Area	4[b,c]	0.51 ± 0.52	1.39 ± 0.36	52.3 ± 15.2	0.42 ± 0.26[e]	NM
300 Area	4[c,f]	1.65 ± 0.76	1.68 ± 0.90	277 ± 174	0.07 ± 0.03	1.74 ± 0.88
400 Area (FFTF)[g]	4[b]	0.97 ± 1.20	6.36 ± 0.80	4,912 ± 328	0.01 ± 0.02	NM
Patrol Academy	1[h,i]	4.55 ± 2.3	4.65 ± 1.8	62.6 ± 130	ND[j]	NM
Yakima Barricade	1[c,h,i]	0.73 ± 1.6	8.49 ± 2.1	8.4 ± 130	0.01 ± 0.03	NM
Standards		15[k,l]	50[l,m]	20,000[l,n]	8[k,l]	13.4[o]

(a) Average value ±2 standard error of the calculated mean.
(b) Grab samples collected and analyzed quarterly.
(c) Untreated raw water.
(d) NM = Not measured.
(e) Three samples only.
(f) Cumulative sample; collected monthly and composited for quarterly analysis.
(g) FFTF = Fast Flux Test Facility.
(h) Grab sample; collected quarterly and composited for annual analysis.
(i) Result ± total analytical error.
(j) ND = No data; laboratory unable to analyze sample.
(k) WAC 246-290.
(l) 40 CFR 141.
(m) Equivalent to 4 mrem/yr standard.
(n) Activity assumed to yield an annual dose of 4 mrem/yr.
(o) Based on an EPA drinking water standard of 20 µg/L and calculated using the specific activities (percent by weight) of naturally occurring uranium-234, -235, and -238.

tritium, and strontium-90 are <50, 15, 20,000, and 8 pCi/L, respectively (40 CFR 141 and WAC 246-290). All DOE-owned drinking water systems on the Hanford Site were in compliance with Washington State and EPA annual average radiological drinking water standards in 1998, and results were similar to those observed in recent years (see Section 4.3 in PNNL-11472 and PNNL-11795).

Activities of uranium, plutonium, americium, and radionuclides measured by gamma spectroscopy at selected locations (see PNNL-12088, APP. 1) were all below drinking water standards.

Raw water samples from all three 400 Area drinking water wells were collected and analyzed monthly by the Hanford Groundwater Monitoring Project. Results from these samples show that tritium levels continued to be lowest in well 499-S0-8J and highest in well 499-S0-7. Tritium levels also increased (>14,000 pCi/L) in well 499-S0-8 from May through August when this well was operated in place of well 499-S1-8J (Table 4.3.3, Figure 4.3.2).

Table 4.3.3. Tritium Activities (pCi/L) in 400 Area Drinking Water Wells, 1998[a]

Sampling Date	Primary Drinking Water Well 499-S1-8J (P-16)	Emergency Drinking Water Well 499-S0-8 (P-14)	Dire Emergency Drinking Water Well 499-S0-7 (P-15)
January 12, 1998	4,680 ± 540	6,350 ± 661	22,100 ± 1,800
February 13, 1998[b]	19,500 ± 1,600	7,240 ± 707	4,880 ± 536
March 16, 1998	4,610 ± 529[c]	9,400 ± 859	18,200 ± 1,500
April 10, 1998	4,900 ± 553	10,500 ± 960	19,500 ± 1,610
May 8, 1998	NS[d]	16,700 ± 1,400	19,200 ± 1,580
June 25, 1998	4,950 ± 545	24,700 ± 1,980	31,500 ± 2,470
July 15, 1998	5,200 ± 563	14,500 ± 1,240	26,000 ± 2,070
	4,730 ± 529[e]		
August 14, 1998	4,650 ± 531	18,000 ± 1,500	22,600 ± 1,830
September 25, 1998	4,470 ± 512	5,800 ± 608	21,500 ± 1,740
October 9, 1998	4,600 ± 524	4,730 ± 533	19,300 ± 1,590
November 9, 1998	4,300 ± 494	4,440 ± 505	17,900 ± 1,480
December 4, 1998	4,770 ± 520	4,660 ± 513	19,700 ± 1,610

(a) Reported concentration ±2 total propagated analytical error.
(b) Samples from wells 499-S1-8J and 499-S0-7 may have been switched and mislabeled.
(c) Sample collected on March 17, 1998.
(d) NS = Not sampled.
(e) An additional sample was collected as a quality control duplicate.

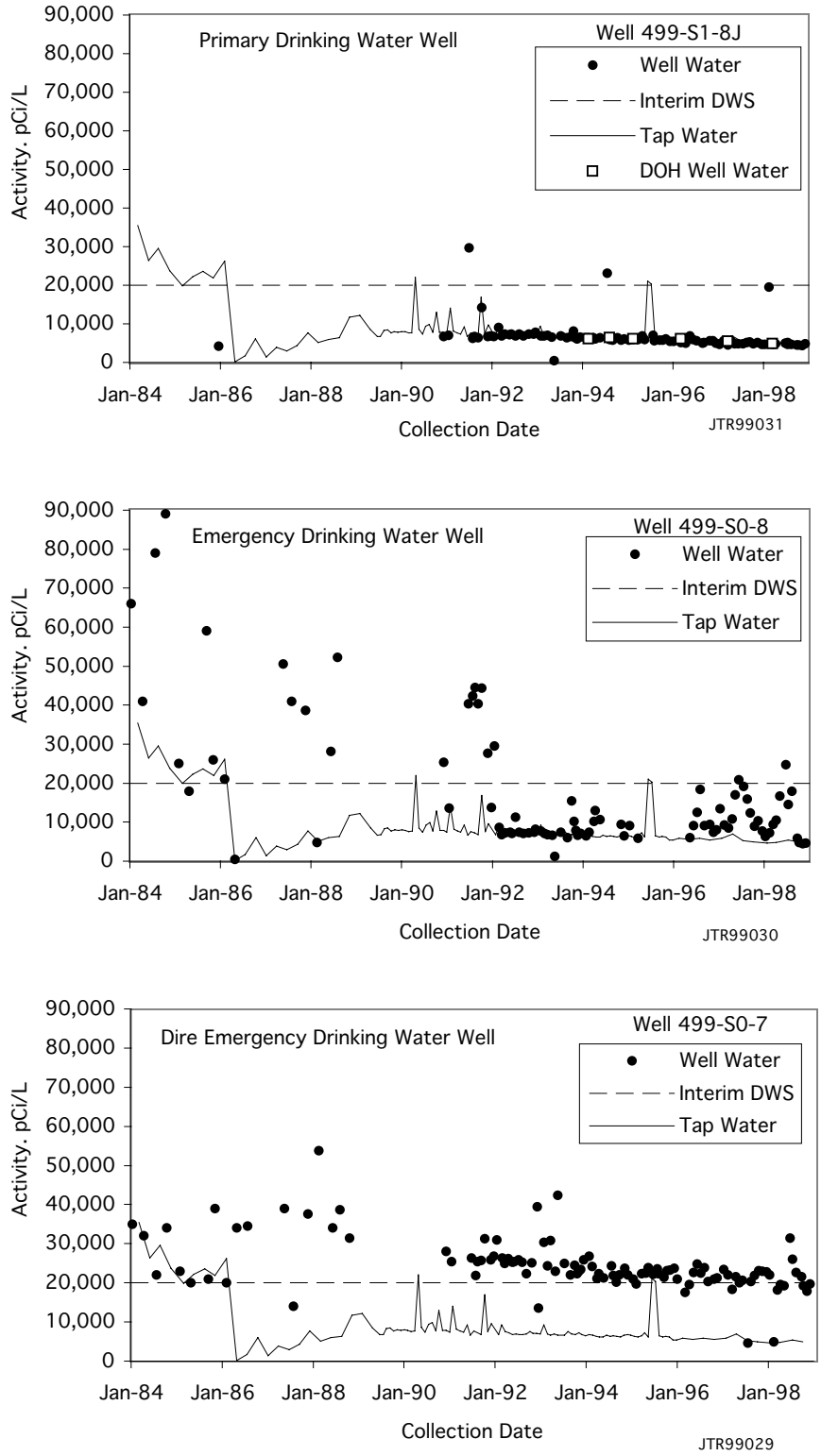

Figure 4.3.2. Tritium Activities in Drinking Water from Three Wells in the 400 Area, 1984 Through 1998 (DOH = Washington State Department of Health, DWS = drinking water standard)